

A-4 Risk assessment of the health effects of solar ultraviolet exposure for effective prevention

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1. Introduction

An increase in ultraviolet exposure due to ozone depletion is one of the most important research areas in global environment problems. The solar radiation, probably the ultraviolet component, is known to cause skin cancer, cataract, and immune dysfunction. According to our estimation, 5% and 10% depletion of ozone will result in increases of UV-B exposure by 6% and 13%, indicating that ozone depletion can cause visible health effects in Japan. Therefore, the increased risk of these diseases should be prevented based on sound scientific evidence.

2. Main research outcomes

A series of prevalence surveys of skin disorders were conducted in several areas of Japan, where the UV-B exposure level varied considerably. In particular, Ison village in Okinawa and Kasa City in Hyogo were selected for detailed periodic skin examinations. The total number of participants was 10,240 in Ison, Okinawa, and 37,941 in Kasai, Hyogo. The prevalence of solar keratosis, a pre-malignant precursor lesion of the skin, was found to be higher in areas of Japan, where the UV-B exposure was higher than other areas. These facts clearly showed that the risk of skin cancer and its premalignant disorders was higher in areas with higher UV-B exposure.

In light of the fact described above, we launched a series of case-control studies to assess the relationship between sun exposure and diseases such as skin cancers on an individual basis. As of the end of FY2001, 174 skin cancer cases and 340 controls participated in the study. This case-control study will be continued and the results will be published within a few years.

To quantitatively assess the risk of cataract, a major health effect of sun exposure in the eyes, we develop a quantitative model to evaluate the exposure of eyes on an individual basis. Using this model, the prevalence of cataract was analyzed in relation to individual UV-B exposure level. As a result, we found a clear positive

association between UV-B exposure and cataract risk in Japan, in Singapore, in Iceland, and between these countries. Furthermore, the protective effect of hats, eye glasses and sunglasses was identified in these populations. These findings show that cataract is one of the major health effects of UV exposure and further that it can be protected by adopting lifestyle modification.

The biological effects of UV radiation were studied for immune response and oxidative stress in the cell. The findings will contribute to bridge the basic biological findings and the health effects in the population.

4. Conclusion

Although there is enough scientific evidence that solar radiation is harmful for human health, little has been done to assess these health effects for Japanese population. It is hoped that the findings we provided in this project will contribute to the health risk assessment of increased UV exposure due to ozone depletion.